Stormwater Pollution Prevention Plan (SWPPP)

South Jackson Avenue
Section 54, Block 1, Lot 44.2
Town of New Windsor
Orange County, NY

Prepared for:

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February 2004
Revised: April 2006
Revised: July 2006

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I. INTRODUCTION

The purpose of this Stormwater Pollution Prevention Plan is to meet the requirements as promulgated by the NYS Dept. of Environmental Conservation (NYSDEC) in their publication, *NYS Stormwater Management Design Manual* (August 2003). The purpose of the plan is to attenuate stormwater which would be generated from this site, as well as to meet the stormwater quality objectives by providing erosion and sediment control during construction and long-term stormwater quality treatment storage during the life of the project.

It will be shown that this project meets both criteria by limiting the amount of peak stormwater runoff for the 1, 10, and 100-year return period storms. In addition, we have designed a stormwater detention pond into the plan which will enhance stormwater runoff before exiting the site.

II. BACKGROUND INFORMATION

A. PROJECT DESCRIPTION

The existing site is located on the East side of Jackson Avenue in the Town of New Windsor, Orange County, NY. The existing site is 69.5 acres.

The project includes the construction of approximately 3,100 linear feet of roadway and 18 lots, ranging in size from approximately 2.0 acres up to 8.0 acres. The existing site includes NYSDEC and U.S. Army Corps of Engineer wetlands. The water supply for the proposed residences will be drilled wells and sewage disposal will be through the use of septic fields.

For this site, standard erosion and sediment control features will be used, including silt fences, inlet protection, and a sediment basin to be installed prior to and during construction to contain silt and sediment on the site. Through the use of erosion and sediment control and the proposed sediment basin, the effects of this site on the surrounding area will be mitigated.

The proposed road features catch basins and drainage piping to drain the road and the upland portion of the site to the proposed stormwater detention pond. This pond will mitigate the effects of the development of the site. The proposed stormwater collection system and detention pond are shown on Drawings C-3, C-4, and C-5.

SWPPP Certification Forms are presented in Appendix H.

III. EXISTING (PRE-DEVELOPMENT) CONDITIONS

A. TOPOGRAPHY

The topography of this site is such that the drainage is split into four (4) separate directions.

The northwest side of the site slopes to an existing wetland. The wetland then drains to a stream, which flows through a box culvert under South Jackson Avenue. This stream is tributary to Beaverdam Lake.

The southwest side of the site also slopes to the wetland. The South section of the wetland drains to a culvert pipe, which flows under South Jackson Avenue. The culvert pipe drains to the stream tributary to Beaverdam Lake.

The northeast corner of the site flows to a separate wetland. This wetland flows North, off the site. This portion of the site drains under Mount Airy Road, and is tributary to Browns Pond.

The southeast portion drains to the South, off the site. It then drains to the East, and joins the stream tributary to Beaverdam Lake.

B. EXISTING LAND USE

The site is currently wooded with pasture over some portions of the site. There are no existing residences on the site.

C. SOIL SURVEY INFORMATION

The existing soils on the site are classified as AC (Alden, extremely stony soils), ErA (Erie gravelly silt loam), ESB (Erie extremely stony soils), MdB, MdC, MdD (Mardin gravelly silt loam), SXC (Swartswood and Mardin very stony soils), and Tg (Tioga silt loam). These soils are classified as being in Group C.

AC (Aldin extremely stony soils) is deep, very poorly drained, nearly level soils in depressions in low areas. The soil is typically classified as ML, OL, CL, CL-ML. Hydrologic group is D.

ErA (Erie gravelly silt loam) is deep, somewhat poorly drained, nearly level soil. This soils is typically classified as GM, ML, SM, GC, SC, CL, CL-ML. Hydrologic group is C.

EsB (Erie extremely stony soils) are deep, somewhat poorly drained gently sloping soils. These soils are typically classified as GM, ML, SM, GC, SC, CL, CL-ML. Hydrologic group is C.

MdB, MdC, MdD (Mardin gravelly silt loam) is deep, moderately well drained soil. It has a dense fragipan in the subsoil. The soil is typically classified as GM, ML, CL, DC, CL-ML, SM-SC. Hydrologic group is C.

SXC (Swartswood and Mardin very stony soils) are well drained and moderately well drained Swartswood soil and moderately well drained Mardin soil. Some areas are Swarswood soil, other areas are Mardin soil, and a few include both soils. These soils are typically classified as SM, ML, GM, GW-GM. Hydrologic group is C.

Tg (Tioga silt loam) is deep well drained, nearly level soil. It is found on flood plains and low terraces. The soil is typically classified as ML, SM, GM, GW-GM. Hydrologic group is B.

This information was used to develop the runoff curve numbers.

D. HYDROLOGIC DATA

For developing the hydrographs, the following hydrologic date for Orange County, NY was utilized:

Design Rainfall Data	
Return Period (Years)	**SCS 24-Hour Precipitation (Inches)**
1	3.00
2	3.50
10	5.50
100	7.50

The project has been split up to four (4) distinct existing drainage areas as previously discussed.

The existing site drains to wetlands on the East, South, and western portions of the site. These wetlands will serve to attenuate the discharge from the site. This is discussed further in subsequent sections.

Drainage areas and runoff curve numbers are presented in Appendix A.

IV. PROPOSED FUTURE (DEVELOPMENT) CONDITIONS

A. MAP OF COMPLETED PROJECT LAYOUT

A map of the completed project is presented as Drawings C-3, C-4, and C-5. The project involves removal of meadow and trees in the area of the proposed homes and lawns, and construction of a loop road to access the proposed lots.

B. CHANGES TO LAND SURFACE

In the areas to be developed, the existing meadow and woods will be removed. These areas will be topsoiled and seeded.

C. CONSTRUCTION SCHEDULE

Construction is scheduled to begin in the fall of 2006. Completion is scheduled for approximately the fall of 2007.

V. COMPARISON OF PRE-DEVELOPMENT WITH POST DEVELOPMENT RUNOFF

A. METHODOLOGIES

The pre-development hydrographs were developed as previously described. The proposed drainage basin to the culvert under South Jackson Avenue has an area of 28.9 acres. The site has an area of approximately 69.5 acres.

Peak rates of runoff for both the pre- and post-developed conditions were calculated utilizing the methodologies outlined in the publication, *Urban Hydrology for Small Water Sheds* (June 1986). Various coefficients used in this analysis were taken from the *Soil Survey of Orange County, NY* (USDA, SCS, October 1981). Routing for the post-developed condition was done utilizing the computer program known as *Hydroflow* (Intelisolve, 2004).

The proposed subdivision will have a detention pond to attenuate increased stormwater runoff from development. Water quality issues will be addressed by use of a permanent pool.

Figure #2 depicts the proposed drainage areas.

The Tc worksheets are presented in Appendix B. The Tc summary is presented in Table #1.

Table #1 — Time of Concentration Summary

Drainage Area	Pre-Development (Min.)	Post-Development (Min.)
To SW	19.9	6.1
To Pond		12.3

By providing detention for the site, we were able to reduce the peak rates of runoff to values approximately the same as the pre-developed rates currently existing. Pre- and post-development hydrographs for the 1, 10, and 100-year return period storms are presented in Appendices C, D, and E.

Table #2 summarizes the pre-, post- and routed peak rates of discharge.

Table #2 — Peak Rates of Discharge

	DA (Ac.)		CN		Discharge (cfs)			
Area	Pre	Post	Pre	Post	Pre	Post	Pre-Routed	Post-Routed
To SW	26.4	19.8	71	73				
Q_1					14.69	17.80		
Q_{10}					53.87	60.27		
Q_{100}					89.99	98.40		
To Pond		9.1		82				
Q_1						12.12		1.45
Q_{10}						31.27		30.66
Q_{100}						47.14		16.10
Combine To SW, To Pond	26.4	28.9						
Q_1					14.69	18.11	4.68	4.29
Q_{10}					53.87	78.58	21.65	26.12
Q_{100}					89.99	133.95	39.19	48.12

In addition to attenuating the design storms, the detention pond addresses the water-quality issues from the development by providing a permanent pool. The detention ponds address the water quality issues from the development by providing a wet pool for water quality. The detention pond is similar to the Wet Pond (P-2) described in the NYS Stormwater Management Design Manual.

VI. CALCULATIONS

Detailed calculations are included in the Appendix of this report.

VII. STORMWATER MANAGEMENT

A. STORMWATER MANAGEMENT FACILITIES

Stormwater management for the facility will consist of a detention pond which has been designed to fit in with the topography of the site and is designed to be a part of the landscape features in the front of the site. We propose gentle slopes of 3:1. The detention pond has been designed as a wet pond, sized to contain the Water Quality Volume (WQ_v) in a wet pool. The detention pond system will be topsoiled and seeded with fine lawn so that it would be mowed and maintained. In order to meet the Stream Channel Protection Volume Requirements (Cpv), the detention ponds provide extended detention of the one-year 24-hour storm event. The Detention Pond Structure features a 4 inch diameter control orifice. This orifice provides the maximum detention possible for the relatively small drainage area.

To meet the Overbank Flood Control criteria (Qp), the detention ponds attenuate the post-development 10-year 24-hour peak discharge rate. In addition, the detention pond attenuates the 100-year 24-hour peak discharge rate. This meets the Extreme Flood Control criteria (Qf). Detention pond calculations are presented in Appendix G.

The bottom of the detention pond has been set to elevation 376.0. A berm divides the detention pond to form a multiple pond system. Cell 1 at the pond inlet is sediment forebay storage equivalent to 10% of the water quality volume (WQ_v). This acts as an upstream pre-treatment device, utilized for maintenance, as well as benefiting the pond longevity. Upon reaching the top of the berm elevation, the stormwater will flow to Cell 2.

Cell 2, the main pond, is designed to hold WQ_v. Forebay storage is also included in the WQ_v. The WQ_v is stored in a permanent pool. Cell 2 contains the control structure.

The pond and the control structure have been designed to handle a 100-year storm. The control structure will consist of a concrete chamber with one (1) controlling orifice. In addition to the controlling orifice, weir inlets act as a spillway to prevent overtopping of the pond. In the event of blocking of the weirs of the control structure, the weir in the pond berm will handle the rise in water elevation which would result from this unlikely occurrence. An 8 inch diameter dewatering pipe has been set to elevation 376.0. This pipe will be used solely for dewatering the pond during periodic maintenance. A pump will be required for dewatering.

The proposed detention pond will discharge to the wetland on the southwest portion of the site. This wetland will serve to attenuate the discharge as it flows to the discharge point at the culvert pipe which flows under South Jackson Avenue. As such, the flow will be attenuated over the length and width of the wetland and have an insignificant effect on the stream.

It should be noted that the proposed peak flows exceed the existing peak flows. It is anticipated that while the proposed peak flows are somewhat greater than the existing peak flow, the wetland will serve to attenuate this peak flow. By the time the flow reaches the stream, the peak flow will be attenuated.

Table #3 — Water Quality Volume (WQ_v)

	Required WQ_v (AC-CF)	Forebay (AC-FT)	El.	Cell 2 (AC-FT)	El.	Total (AC-FT)
Detention Pond	0.34	0.10	380.0	0.39	380.0	0.49

B. STORMWATER CONVEYANCE SYSTEM

The stormwater conveyance system is presented on the drawing. The system will consist of catch basins located along the roadway with associated piping conveying the stormwater flow from the roadway and upland area into the stormwater detention pond.

C. LANDSCAPE FEATURES

As part of the overall development of the site, we are attempting to maintain much of the existing vegetation on the site. In those areas that would be disturbed, we would provide a fine lawn and landscaping features.

VIII. EROSION AND SEDIMENT CONTROL

A. TEMPORARY EROSION AND SEDIMENT CONTROL FACILITIES

The Erosion and Sediment Control Plan for the proposed site will utilize silt fences, inlet protection, and a sediment basin to be installed prior to and during construction. These controls will contain the silt and sediment on site. These facilities will be maintained during construction by the contractor and they will remain in place through the period of construction, until vegetation is established.

Silt Fence: Silt fence will be installed on the downslope side of disturbed areas, as shown on the Erosion and Sediment Control Plan.

Construction Road Stabilization: As soon as final grade is reached on the road, the subgrade will be sloped stabilized with 6 inches of Type 4 subbase course, Item 304.05. This will prevent erosion and dust during the construction prior to paving.

Sediment Basin: A Sediment Basin will be constructed at the low point of the property. Water from disturbed areas will be directed to the basin before leaving the site. Sediment Basin Profiles and Details are shown on the drawings.

Upon completion of the roadway and stabilization of the site, the sediment basin will be converted to a detention pond. The basin will be pumped to be reasonably dry. Discharge from the pumps will be filtered. After filtering, the water will be discharged to downstream of the basin. An excavator will then remove accumulated sediment. The sediment shall be disposed of in accordance with applicable regulations. Construction of the detention pond will then begin.

Temporary Gravel Construction Entrance/Exit: A temporary gravel construction entrance will be installed at the entrance to the property.

Stone and Block Drop Inlet Protection: Stone and block drop inlet protection will be installed at the drop inlets. This device will reduce the sediment load on the storm drain piping.

Grading: Grading will be required on the site. Upon completion of rough grading, the area will be temporarily vegetated.

Surface Stabilization: Stabilization of the surface will be accomplished with vegetation and mulch as specified in the Erosion and Sediment Control Plan. Roadway subbase course will be installed as soon as finished grade is reached.

Dust Control: Dust control is not anticipated to be a problem. Should excessive dust be generated by construction activities, the contractor will control it by sprinkling water on the disturbed areas.

Soil Stockpiling: Since the majority of this site is in cut, minimal stockpiling is anticipated. Stockpiles shall be enclosed with silt fence.

B. PERMANENT EROSION AND SEDIMENT CONTROL FACILITIES

Upon establishment of vegetation, the stormwater detention pond will provide sediment control. The lawn areas will be maintained and mowed by the new homeowners. The establishment of vegetation will proceed as construction proceeds in the fall of 2006, and will continue as homes are completed through the fall of 2007.

C. POLLUTION PREVENTION MEASURES DURING CONSTRUCTION (OTHER THAN SOIL DISTURBANCE)

The following product-specific practices will be followed on site:

Petroleum Products: All on-site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the change of leakage. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used on site will be applied according to the manufacturer's recommendations.

Fertilizers: Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints: All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturers' instructions or state and local regulations.

Concrete Trucks: Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum-wash water on the site.

Waste Disposal: All waste materials and litter will be collected and stored in a securely lidded metal dumpster rented from Waste Management (WM), which is a licensed solid waste management company in Chester, Orange County, NY. The dumpster will meet all local and any state solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied as often as necessary, and the trash will be hauled to the WM transfer station. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer.

Hazardous Waste: All hazardous waste materials will be disposed of in the manner specified by the local or state regulations or by the manufacturer. Site personnel will be instructed in these practices.

Sanitary Waste: All sanitary waste will be collected from the portable units a minimum of three (3) times per week by a licensed sanitary waste management contractor.

Recyclable Waste: All recyclable waste (cardboard, wood, etc.) shall be collected and recycled.

Refueling: All refueling, repair, and changing of equipment and vehicle fluids shall be conducted in a designated area, if practicable. This area will be designed in a manner to reduce the potential for contamination of on-site resources. For refueling, repair, and changing of equipment and vehicles outside of the designated areas, care should be taken to avoid activities with ±100 feet of wetlands, streams, water bodies, or other environmentally-sensitive areas.

D. ON-SITE STORAGE OF CONSTRUCTION AND WASTE MATERIALS

Spill Prevention Inventory: The materials or substances listed below are expected to be present on site during construction:

Concrete	Detergents	Roofing
Metal Studs	Paints (Enamel and Latex)	Wood
Petroleum-based Products	Fertilizers	Tar
Masonry Block	Cleaning Solvents	

Material Management Practices:

The following are the management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances listed above to stormwater runoff:

- Products will be kept in original containers unless they are not resealable.
- Original labels and material safety data sheets will be retained.
- An effort will be made to store only enough products required to do the job.
- All materials stored on site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure and/or on blacktop.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturers' recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure the proper use and disposal of materials on site.
- Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on site. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of any size of toxic or hazardous material will be reported to the NYSDEC or the Town of New Windsor Building Department.

The spill prevention plan will be adjusted to include measures to prevent this type of spill from recurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.

IX. IMPLEMENTATION SCHEDULE AND MAINTENANCE

A. IMPLEMENTATION SCHEDULE FOR STAGING OF ALL STORMWATER MANAGEMENT FACILITIES.

The Erosion and Sediment Control Plan for the proposed site will utilize silt fences, inlet protection, and sediment basin to be installed prior to and during construction to contain silt and sediment on site. These facilities will be placed as shown on the plans and are to be maintained during construction to ensure that they will continue to remove sediment throughout the period of construction.

There will be existing topsoil on site to be stockpiled. All areas of construction that will not be seeded within 14 days will receive temporary seeding as specified on the plans. When construction is completed, topsoil will be brought in and spread to a depth of 6 inches and a permanent vegetative cover established. Upon determination that the vegetation cover has reached the level where sedimentation will not be a problem, all the sedimentation control can then be removed.

As part of the development, the following will take place for implementing the erosion and sediment controls:

1) Installation of stabilized construction entrance.
2) Installation of silt fencing as shown on the plan.
3) General site clearing of trees and vegetation for the areas disturbed.
4) Soil stockpiling and rough grading.
5) Construction of the sediment basin.
6) Install subbase for the roadway.
7) Temporary seeding.
8) Construction of houses.
9) Installation of the stormwater conveyance system, including inlet protection.
10) Install curb around the roadway.
11) Place base course of asphalt.
12) Topsoil, permanent seeding, and landscaping.
13) Upon final completion of houses, install asphalt top course.
14) Remove erosion and sediment control.

Inspection of erosion and sediment control shall be performed every seven (7) calendar days and after periods of rainfall greater than 0.5 inch.

B. DESCRIPTION OF ARRANGEMENTS (LONG-TERM MAINTENANCE)

These items will be handled by Shadowfax Run Development, LP.

All soil erosion and sediment control practices will be checked for stability and operation following every runoff-producing rainfall but in no case less than once every week. Any needed repairs will be made immediately to maintain all practices as designed.

The sediment basin will be cleaned out when the level of sediment reaches 1.0 feet below the top of the orifice.

Sediment will be removed from the sediment trap and block and gravel inlet protection device when storage capacity has been approximately 50% filled.

Sediment will be removed from behind the silt fence when it Sediment will be removed from behind the silt fence when it becomes about 0.5 feet deep at the fence. The silt fence will be repaired as necessary to maintain a barrier.

All seeded areas will be fertilized, reseeded as necessary, and mulched to maintain a vigorous, dense vegetative cover.

C. DESCRIPTION OF ARRANGEMENTS (LONG-TERM MAINTENANCE)

These items will be handled by Town of New Windsor Department of Public Works (DPW).

The only long-term maintenance required for this project is cleaning of the catch basins, associated storm sewer piping, and detention pond. The maintenance is expected to include cleaning of the detention pond every two (2) years. These items will be handled by the Town of New Windsor DPW, as all facilities will be dedicated to them upon completion of the project.

The catch basins will be inspected by Town of New Windsor DPW personnel. If they are visually observed to contain sediment more than 12 inches deep, cleaning will be scheduled. The catch basins will be cleaned by using a vacuum truck to remove sediment and accumulated debris from the basins.

The detention pond will be inspected by Town of New Windsor DPW personnel monthly. At that time, any wind-blown or floating trash will be removed from the ponds and disposed of. The accumulated sediment shall be measured by personnel, utilizing a calibrated measuring rod. Upon measuring sediment, the readings will be recorded in a log book. The detention ponds will be cleaned out when accumulated sediment reaches the elevations shown in the table below.

Table #4 — Cleanout Elevation

	Forebay (CY)	El.	Cell 2 (CY)	El.
Detention Pond	83	378.4	322	378.4

The cleaning procedure shall be similar to as previously described for the sediment basins. The ponds will be pumped to be reasonably dry. Discharge from the pumps will be filtered. After filtering, the water will be discharged to the channels downstream of the ponds. An excavator will then remove accumulated sediment. The sediment shall be disposed of in accordance with applicable regulations.

X. ACCOUNTABILITY DURING PLAN IMPLEMENTATION

Shadowfax Run Development, LP will be responsible for the implementation of the soil erosion and sediment control during construction. Maintenance will include the routine cleaning of catch basins, the cleaning and cutting of grass swales, and the cleaning of the sediment basin. The project would be overseen by the Town of New Windsor Building Dept. who will ensure that the project and the associated improvements are implemented correctly.

XI. WORKS CITED

Intelisolve, (2004), Hydroflow, Computer Program, Alpharetta, GA

New York State Department of Environmental Conservation (NYSDEC), (August 2003), *New York State Stormwater Management Design Manual*, Albany, NY

New York State Dept. of Environmental Conservation, (January 2004), *Standards and Specifications for Erosion and Sediment Control*, Albany, NY

Soil Conservation Service (SCS), (October 1981), *Soil Survey of Orange County*, New York, NY

Soil Conservation Service (SCS), (June 1986), *Urban Hydrology for Small Water Sheds*, New York, NY

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FIGURES

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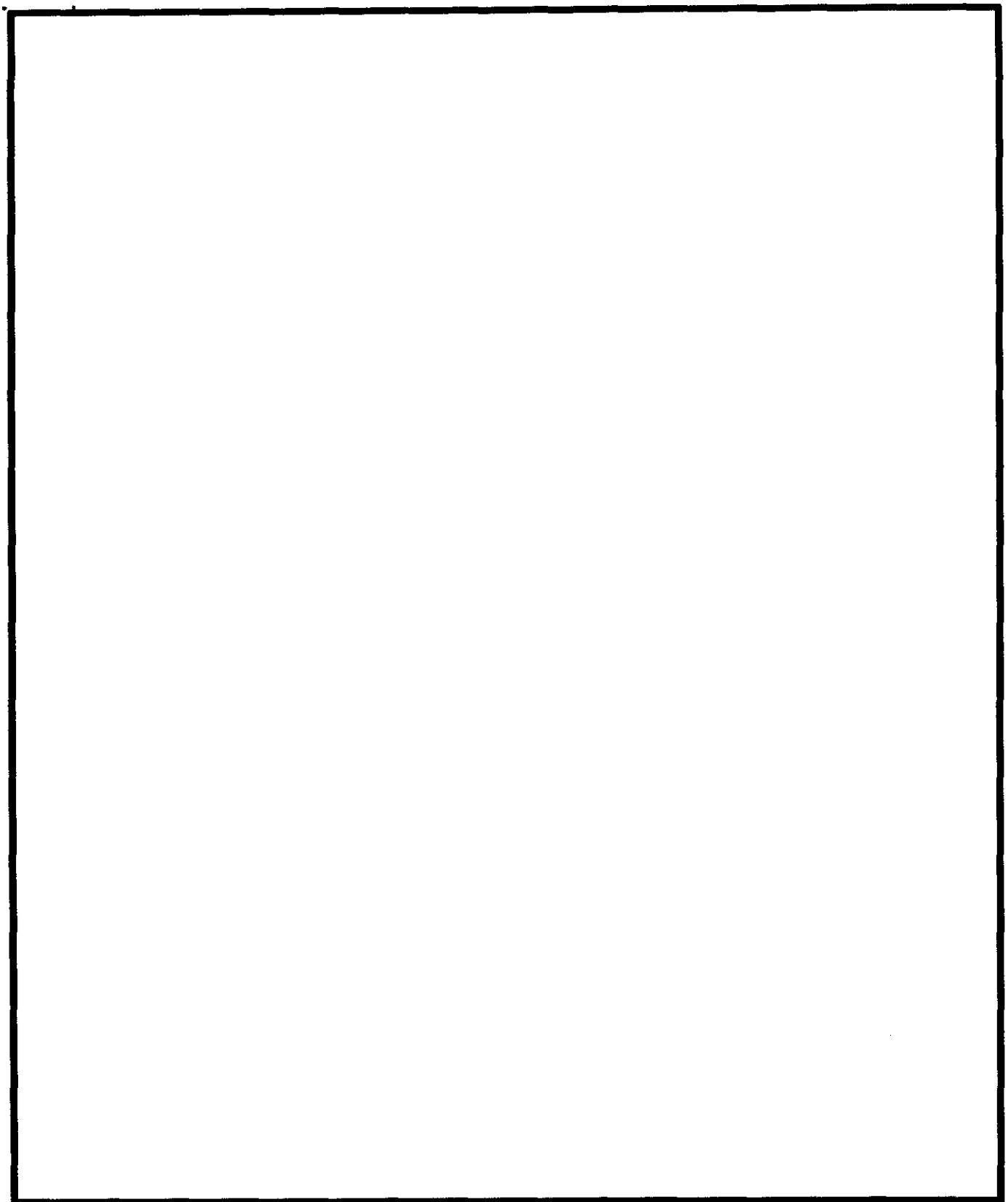
Pre-Development Drainage Area Map

Figure #1



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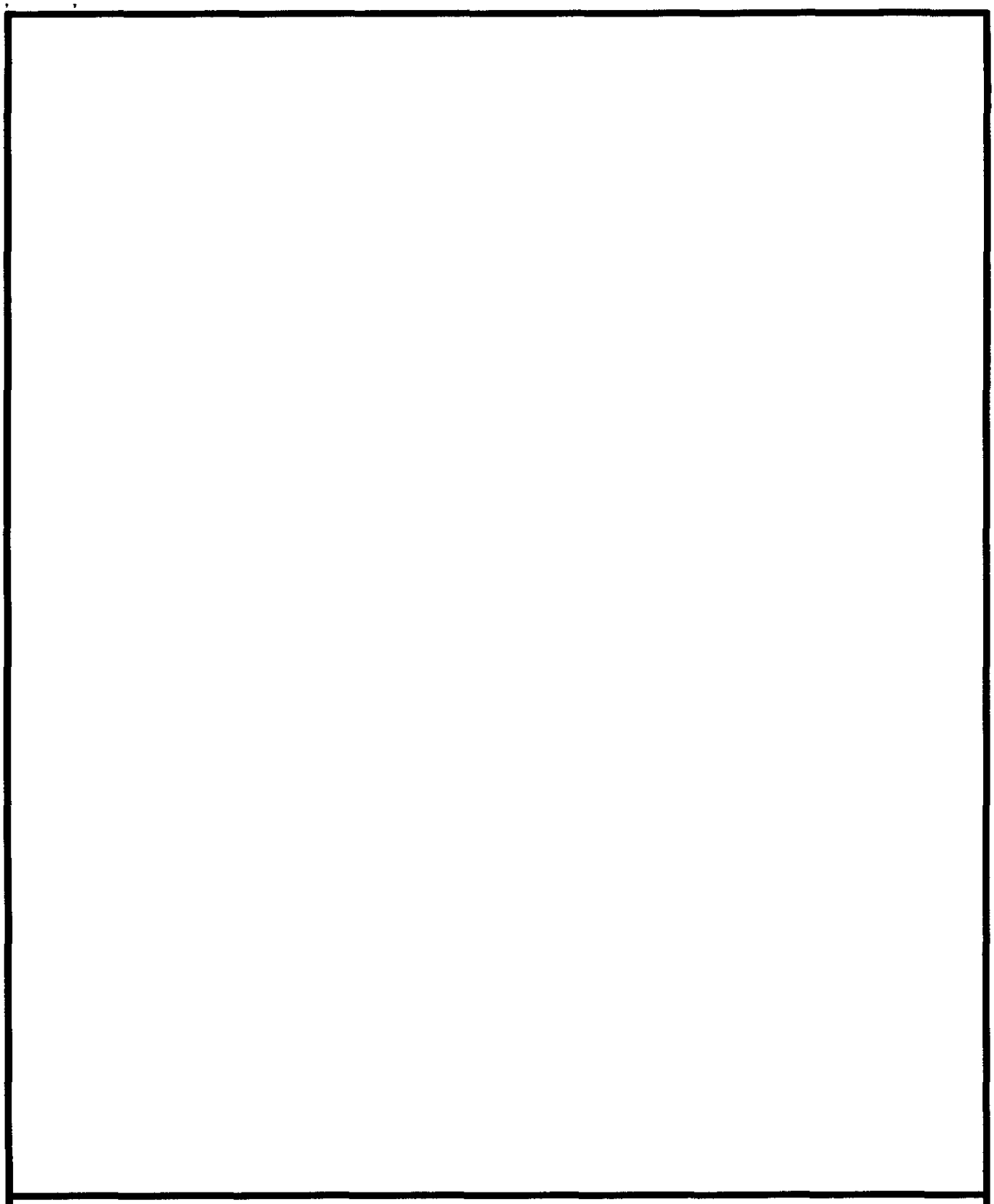
Post-Development Drainage Area Map

Figure #2



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Site Soils

Figure #3

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APPENDICES

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Drainage Areas and Runoff Curve Numbers

Appendix A

Shadowfax Run Development
Drainage Areas and Runoff Curve Numbers
Hydrologic Soil Group C

Hydrograph	Description	Cover Type				Total (AC)	CN
		Woods (Good) CN 70 (AC)	Meadow CN 71 (AC)	Lawn (Good) CN 74 (AC)	Road CN 98 (AC)		
	Pre-Dev Area to N	0.90				0.90	70
	Pre-Dev Area to S	3.80	0.50			4.30	70
1	Pre-Dev Area to SW	15.90	10.20		0.30	26.40	71
	Pre-Development Total					31.60	
	Post-Dev Area to S	1.80		0.90		2.70	71
4	Post-Dev Area to SW	10.40	3.40	4.67	1.33	19.80	73
5	Post-Dev Area to Pond	0.30	0.60	4.90	3.30	9.10	82
	Post-Development Total					31.60	

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Time of Concentration Worksheets

Appendix B

TR55 Tc Worksheet

Hyd. No. 1

Pre-Dev Area to SW

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 150.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.50	0.00	0.00	
Land slope (%)	= 3.30	0.00	0.00	
Travel Time (min)	**= 15.45**	**+ 0.00**	**+ 0.00**	**= 15.45**
Shallow Concentrated Flow				
Flow length (ft)	= 1150.00	0.00	0.00	
Watercourse slope (%)	= 7.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 4.27	0.00	0.00	
Travel Time (min)	**= 4.49**	**+ 0.00**	**+ 0.00**	**= 4.49**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 19.90 min

TR55 Tc Worksheet

Hyd. No. 4

Post-Dev Area to SW

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.150	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.50	0.00	0.00	
Land slope (%)	= 12.00	0.00	0.00	
Travel Time (min)	**= 4.58**	**+ 0.00**	**+ 0.00**	**= 4.58**
Shallow Concentrated Flow				
Flow length (ft)	= 380.00	0.00	0.00	
Watercourse slope (%)	= 6.60	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 4.15	0.00	0.00	
Travel Time (min)	**= 1.53**	**+ 0.00**	**+ 0.00**	**= 1.53**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 6.10 min

TR55 Tc Worksheet

Hyd. No. 5

Post-Dev Area to Pond

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.50	0.00	0.00	
Land slope (%)	= 5.00	0.00	0.00	
Travel Time (min)	**= 9.46**	**+ 0.00**	**+ 0.00**	**= 9.46**
Shallow Concentrated Flow				
Flow length (ft)	= 490.00	0.00	0.00	
Watercourse slope (%)	= 9.60	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 5.00	0.00	0.00	
Travel Time (min)	**= 1.63**	**+ 0.00**	**+ 0.00**	**= 1.63**
Channel Flow				
X sectional flow area (sqft)	= 0.88	0.00	0.00	
Wetted perimeter (ft)	= 2.36	0.00	0.00	
Channel slope (%)	= 3.20	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 9.18	0.00	0.00	
Flow length (ft)	= 670.0	0.0	0.0	
Travel Time (min)	**= 1.22**	**+ 0.00**	**+ 0.00**	**= 1.22**

Total Travel Time, Tc ..... 12.30 min

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Pre- and Post-Development Hydrographs
1-Year Return Interval Storm

Appendix C

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	14.69	2	736	72,871	----	------	------	Pre-Dev Area to SW
2	Reach	4.68	2	772	74,126	1	------	------	Wetland to culvert
~~4~~	~~SCS Runoff~~	~~17.80~~	~~2~~	~~724~~	~~57,769~~				~~Post-Dev Area to SW~~
~~5~~	~~SCS Runoff~~	~~12.12~~	~~2~~	~~728~~	~~46,976~~				~~Post-Dev Area to Pond~~
~~6~~	~~Reservoir~~	~~1.45~~	~~2~~	~~702~~	~~45,629~~	~~5~~	~~382.44~~	~~45,107~~	~~Detention Pond~~
~~7~~	~~Combine~~	~~18.11~~	~~2~~	~~724~~	~~103,399~~	~~4, 6~~			~~Combine at Wetland~~
~~8~~	~~Reach~~	~~4.20~~	~~2~~	~~754~~	~~103,100~~	~~7~~			~~Wetland to Culvert~~

Hydrograph Report

Hyd. No. 2

Wetland to culvert

Hydrograph type	= Reach	Peak discharge	= 4.68 cfs
Storm frequency	= 1 yrs	Time interval	= 2 min
Inflow hyd. No.	= 1	Section type	= Trapezoidal
Reach length	= 530.0 ft	Channel slope	= 0.70 %
Manning's n	= 0.400	Bottom width	= 50.00 ft
Side slope	= 50.0:1	Max. depth	= 4.00 ft
Rating curve x	= 0.023	Rating curve m	= 1.275
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0254

Modified Att-Kin routing method used.

Hydrograph Volume = 74,126 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.67	6.11	4.49
12.70	5.54	4.56
12.73	5.05	4.61
12.77	4.64	4.64
12.80	4.31	4.67
12.83	4.04	4.68
12.87	3.82	4.68 <<
12.90	3.65	4.67
12.93	3.51	4.65
12.97	3.39	4.63
13.00	3.30	4.61
13.03	3.20	4.58
13.07	3.11	4.55
13.10	3.02	4.52
13.13	2.94	4.49
13.17	2.86	4.45

...End

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
~~1~~	~~SCS Runoff~~	~~14.69~~	~~2~~	~~736~~	~~72,874~~				~~Pre-Dev Area to SW~~
~~2~~	~~Reach~~	~~4.68~~	~~2~~	~~772~~	~~74,126~~	~~1~~			~~Wetland to culvert~~
4	SCS Runoff	17.80	2	724	57,769	---	-----	-----	Post-Dev Area to SW
5	SCS Runoff	12.12	2	728	46,976	---	-----	-----	Post-Dev Area to Pond
6	Reservoir	1.45	2	792	45,629	5	382.44	45,107	Detention Pond
7	Combine	18.11	2	724	103,399	4, 6	-----	-----	Combine at Wetland
8	Reach	4.29	2	754	103,190	7	-----	-----	Wetland to Culvert

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, Apr 10 2006, 2:34 PM

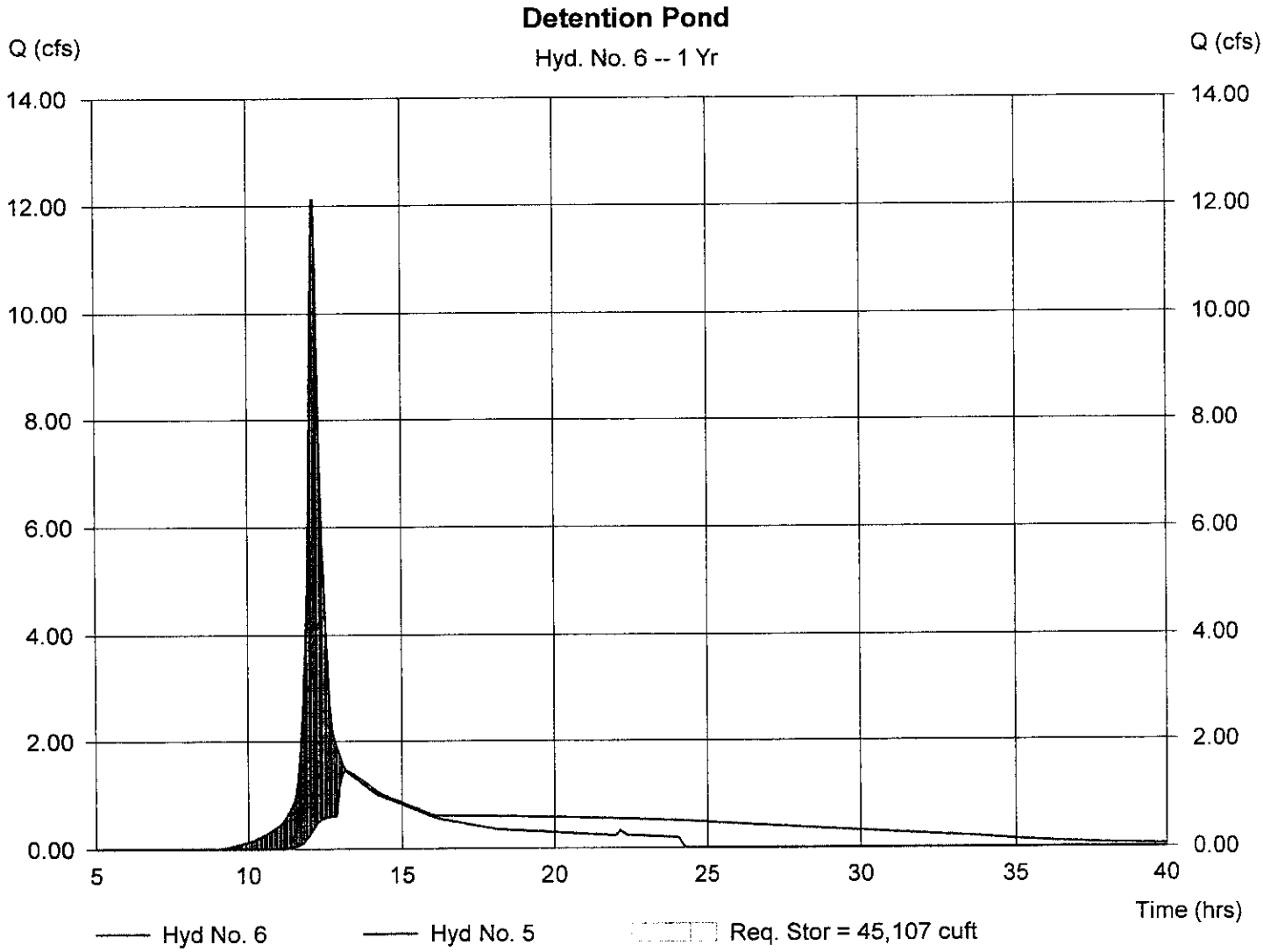
Hyd. No. 6

Detention Pond

Hydrograph type	= Reservoir	Peak discharge	= 1.45 cfs
Storm frequency	= 1 yrs	Time interval	= 2 min
Inflow hyd. No.	= 5	Max. Elevation	= 382.44 ft
Reservoir name	= Detention Pond	Max. Storage	= 45,107 cuft

Storage Indication method used. Wet pond routing start elevation = 379.80 ft.

Hydrograph Volume = 45,629 cuft



Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Monday, Apr 10 2006, 2:34 PM

Hyd. No. 8

Wetland to Culvert

Hydrograph type	= Reach	Peak discharge	= 4.29 cfs
Storm frequency	= 1 yrs	Time interval	= 2 min
Inflow hyd. No.	= 7	Section type	= Trapezoidal
Reach length	= 530.0 ft	Channel slope	= 0.70 %
Manning's n	= 0.400	Bottom width	= 50.00 ft
Side slope	= 50.0:1	Max. depth	= 4.00 ft
Rating curve x	= 0.023	Rating curve m	= 1.275
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0275

Modified Att-Kin routing method used.

Hydrograph Volume = 103,190 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.40	7.08	4.08
12.43	6.42	4.16
12.47	5.74	4.22
12.50	5.03	4.26
12.53	4.38	4.28
12.57	3.91	4.29 <<
12.60	3.67	4.28
12.63	3.57	4.26
12.67	3.50	4.24
12.70	3.44	4.22
12.73	3.37	4.20
12.77	3.30	4.18
12.80	3.23	4.15
12.83	3.16	4.13
12.87	3.09	4.10

...End

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Pre- and Post-Development Hydrographs
10-Year Return Interval Storm

Appendix D

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	53.87	2	734	239,715	----	------	------	Pre-Dev Area to SW
2	Reach	21.65	2	762	243,962	1	------	------	Wetland to culvert
~~4~~	~~SCS Runoff~~	~~60.27~~	~~2~~	~~724~~	~~180,507~~				~~Post-Dev Area to SW~~
~~5~~	~~SCS Runoff~~	~~34.27~~	~~2~~	~~728~~	~~120,248~~				~~Post-Dev Area to Pond~~
~~6~~	~~Reservoir~~	~~39.66~~	~~2~~	~~730~~	~~118,992~~	~~5~~	~~382.86~~	~~50,948~~	~~Detention Pond~~
~~7~~	~~Combine~~	~~78.58~~	~~2~~	~~726~~	~~299,408~~	~~4, 6~~			~~Combine at Wetland~~
~~8~~	~~Reach~~	~~26.12~~	~~2~~	~~750~~	~~299,204~~	~~7~~			~~Wetland to Culvert~~

Hydrograph Report

Hyd. No. 2

Wetland to culvert

Hydrograph type	= Reach	Peak discharge	= 21.65 cfs
Storm frequency	= 10 yrs	Time interval	= 2 min
Inflow hyd. No.	= 1	Section type	= Trapezoidal
Reach length	= 530.0 ft	Channel slope	= 0.70 %
Manning's n	= 0.400	Bottom width	= 50.00 ft
Side slope	= 50.0:1	Max. depth	= 4.00 ft
Rating curve x	= 0.023	Rating curve m	= 1.275
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0343

Modified Att-Kin routing method used.

Hydrograph Volume = 243,962 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.53	27.81	20.57
12.57	24.91	21.04
12.60	22.42	21.36
12.63	20.18	21.56
12.67	18.14	21.65
12.70	16.35	21.65 <<
12.73	14.84	21.58
12.77	13.58	21.45
12.80	12.54	21.27
12.83	11.70	21.05
12.87	11.03	20.80

...End

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
~~1~~	~~SCS Runoff~~	~~53.87~~	~~2~~	~~734~~	~~239,715~~				~~Pre-Dev Area to SW~~
~~2~~	~~Reach~~	~~21.65~~	~~2~~	~~762~~	~~243,962~~	~~1~~			~~Wetland to culvert~~
4	SCS Runoff	60.27	2	724	180,507	----	------	------	Post-Dev Area to SW
5	SCS Runoff	31.27	2	728	120,248	----	------	------	Post-Dev Area to Pond
6	Reservoir	30.66	2	730	118,902	5	382.86	50,018	Detention Pond
7	Combine	78.58	2	726	299,408	4, 6	------	------	Combine at Wetland
8	Reach	26.12	2	750	299,201	7	------	------	Wetland to Culvert

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Monday, Apr 10 2006, 2:34 PM

Hyd. No. 8

Wetland to Culvert

Hydrograph type	= Reach	Peak discharge	= 26.12 cfs
Storm frequency	= 10 yrs	Time interval	= 2 min
Inflow hyd. No.	= 7	Section type	= Trapezoidal
Reach length	= 530.0 ft	Channel slope	= 0.70 %
Manning's n	= 0.400	Bottom width	= 50.00 ft
Side slope	= 50.0:1	Max. depth	= 4.00 ft
Rating curve x	= 0.023	Rating curve m	= 1.275
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0371

Modified Att-Kin routing method used.

Hydrograph Volume = 299,201 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.37	39.19	24.94
12.40	35.19	25.47
12.43	31.52	25.83
12.47	28.08	26.04
12.50	24.74	26.12 <<
12.53	21.60	26.07
12.57	19.05	25.90
12.60	17.21	25.65
12.63	15.87	25.33
12.67	14.82	24.98

...End

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Pre- and Post-Development Hydrographs
100-Year Return Interval Storm

Appendix E

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	89.99	2	734	397,509	----	------	------	Pre-Dev Area to SW
2	Reach	39.19	2	758	404,577	1	------	------	Wetland to culvert
~~4~~	~~SCS Runoff~~	~~98.40~~	~~2~~	~~724~~	~~294,433~~				~~Post-Dev Area to SW~~
~~5~~	~~SCS Runoff~~	~~47.14~~	~~2~~	~~728~~	~~183,491~~				~~Post-Dev Area to Pond~~
~~6~~	~~Reservoir~~	~~46.40~~	~~2~~	~~730~~	~~182,144~~	~~5~~	~~382.97~~	~~51,424~~	~~Detention Pond~~
~~7~~	~~Combine~~	~~193.96~~	~~2~~	~~724~~	~~476,577~~	~~4, 6~~			~~Combine at Wetland~~
~~8~~	~~Reach~~	~~48.52~~	~~2~~	~~746~~	~~476,368~~	~~7~~			~~Wetland to Culvert~~

Hydrograph Report

Hydraflow Hydrographs by Intelisolve | Monday, Apr 10 2006, 2:33 PM

Hyd. No. 2

Wetland to culvert

Hydrograph type	= Reach	Peak discharge	= 39.19 cfs
Storm frequency	= 100 yrs	Time interval	= 2 min
Inflow hyd. No.	= 1	Section type	= Trapezoidal
Reach length	= 530.0 ft	Channel slope	= 0.70 %
Manning's n	= 0.400	Bottom width	= 50.00 ft
Side slope	= 50.0:1	Max. depth	= 4.00 ft
Rating curve x	= 0.023	Rating curve m	= 1.275
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0383

Modified Att-Kin routing method used.

Hydrograph Volume = 404,577 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.53	44.17	38.00
12.57	39.45	38.64
12.60	35.43	39.03
12.63	31.82	39.19 <<
12.67	28.54	39.16
12.70	25.68	38.97
12.73	23.27	38.66
12.77	21.26	38.25
12.80	19.61	37.76

...End

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
~~1~~	~~SCS Runoff~~	~~89.99~~	~~2~~	~~734~~	~~397,589~~	~~----~~	~~------~~	~~------~~	~~Pre-Dev Area to SW~~
~~2~~	~~Reach~~	~~39.49~~	~~2~~	~~758~~	~~404,577~~	~~1~~			~~Wetland to culvert~~
4	SCS Runoff	98.40	2	724	294,433	----	------	------	Post-Dev Area to SW
5	SCS Runoff	47.14	2	728	183,491	----	------	------	Post-Dev Area to Pond
6	Reservoir	46.40	2	730	182,144	5	382.97	51,424	Detention Pond
7	Combine	133.95	2	724	476,577	4, 6	------	------	Combine at Wetland
8	Reach	48.52	2	746	476,368	7	------	------	Wetland to Culvert

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Monday, Apr 10 2006, 2:34 PM

Hyd. No. 8

Wetland to Culvert

Hydrograph type	= Reach	Peak discharge	= 48.52 cfs
Storm frequency	= 100 yrs	Time interval	= 2 min
Inflow hyd. No.	= 7	Section type	= Trapezoidal
Reach length	= 530.0 ft	Channel slope	= 0.70 %
Manning's n	= 0.400	Bottom width	= 50.00 ft
Side slope	= 50.0:1	Max. depth	= 4.00 ft
Rating curve x	= 0.023	Rating curve m	= 1.275
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0420

Modified Att-Kin routing method used.

Hydrograph Volume = 476,368 cuft

(Printed values >= 95% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.33	65.09	47.16
12.37	58.33	47.92
12.40	52.23	48.36
12.43	47.20	48.52 <<
12.47	42.17	48.46
12.50	37.14	48.20
12.53	32.38	47.73
12.57	28.54	47.09
12.60	25.78	46.31

...End

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Sediment Basin Calculations

Appendix F

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

Computed by BGC Date 4/5/06 Checked by _____ Date _____

Project SHADOW FAX RUN DEVELOPMENT Basin # A

Location ADJACENT WETLAND Total Area draining to basin 9.1 Acres

BASIN SIZE DESIGN

1. Minimum sediment storage volume = 134 cu. yds. x 9.1 acres of drainage area = 1,219 cu.yds. USE 797
2. a. Cleanout at 50 percent of minimum required volume = 610 cu. yds. USE 405
   b. Elevation corresponding to scheduled time to clean out 378.4
   c. Distance below top of riser 1.6 feet
3. Minimum surface area is larger of 0.01 $Q_{(1)}$ _____ or, 0.015 DA = _____ use _____ acres

DESIGN OF SPILLWAYS & ELEVATIONS

Runoff

4. $Q_{p(10)}$ = 31.27 cfs
   (EFH, Ch. 2, TR-55, or Section 4; Attach runoff computation sheet)

Pipe Spillway (Q_{ps})

5. Min. pipe spillway cap., Q_{ps} = 0.2 x 9.1 ac. Drainage = 1.82 cfs
   Note: If there is no emergency spillway, then req'd $Q_{ps} = Q_{p(10)}$ = 31.27 cfs.
6. H = _____ ft. Barrel length = _____ ft
7. Barrel: Diam. _____ inches; Q_{ps} = (Q) _____ x (cor.fac.) _____ = _____ cfs.
8. Riser: Diam. _____ inches; Length _____ ft.; h = _____ ft. Crest Elev. _____
9. Trash Rack: Diam. _____ inches; H = _____ inches

Emergency Spillway Design

10. Emergency Spillway Flow, $Q_{es} = Q_p - Q_{ps}$ = _____ - _____ = _____ cfs.
11. Width 30 ft.; H_p _____ ft Crest elevation 382.5 ; Design High Water Elev. 383.0
    Entrance channel slope 0 % ; Top of Dam Elev. 384.0
    Exit channel slope 0 %

ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

y = 383.0 - 380.0 = 3

Collars:

12. y = 3 ft.; z = 3 :1; pipe slope = 1.7 %, L_s = 23 ft.
    Use 2 collars, 4' - 0" inches square; projection = 0.9 ft.

Diaphragms:

_____ width _____ ft. height _____ ft.

DEWATERING ORIFICE SIZING

13. $Ao = \frac{A_s \times (2h)^{0.5}}{122{,}568}$ = _____ sq. ft.; h = _____ ft.; therefore use, 8" PIPE

Pond Report

Hydraflow Hydrographs by Intelisolve

Thursday, Apr 6 2006, 4:33 PM

Pond No. 1 - ~~Detention Pond~~ SEDIMENT BASIN

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	376.00	3,040	0	0
2.00	378.00	5,260	8,300	8,300
4.00	380.00	7,970	13,230	21,530
6.00	382.00	10,440	18,410	39,940
8.00	384.00	13,130	23,570	63,510

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 24.00	4.00	0.00	0.00
Span (in)	= 24.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 380.00	380.00	0.00	0.00
Length (ft)	= 30.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	30.00	0.00	0.00
Crest El. (ft)	= 382.50	382.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Ciplti	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control. Weir riser checked for orifice conditions.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	376.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.20	830	376.20	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.40	1,660	376.40	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.60	2,490	376.60	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.80	3,320	376.80	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.00	4,150	377.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.20	4,980	377.20	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.40	5,810	377.40	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.60	6,640	377.60	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.80	7,470	377.80	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	8,300	378.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.20	9,623	378.20	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
CLEANOUT 2.40	405 10,946	378.40	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.60	12,269	378.60	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.80	13,592	378.80	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.00	14,915	379.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.20	16,238	379.20	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.40	17,561	379.40	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.60	18,884	379.60	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.80	20,207	379.80	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
STORAGE 4.00	797 21,530	380.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.20	23,371	380.20	0.08	0.08	---	---	0.00	0.00	---	---	---	0.08
4.40	25,212	380.40	0.20	0.20	---	---	0.00	0.00	---	---	---	0.20
4.60	27,053	380.60	0.27	0.27	---	---	0.00	0.00	---	---	---	0.27
4.80	28,894	380.80	0.32	0.32	---	---	0.00	0.00	---	---	---	0.32
5.00	30,735	381.00	0.38	0.37	---	---	0.00	0.00	---	---	---	0.37
5.20	32,576	381.20	0.41	0.41	---	---	0.00	0.00	---	---	---	0.41
5.40	34,417	381.40	0.45	0.45	---	---	0.00	0.00	---	---	---	0.45
5.60	36,258	381.60	0.48	0.48	---	---	0.00	0.00	---	---	---	0.48
5.80	38,099	381.80	0.52	0.52	---	---	0.00	0.00	---	---	---	0.52
6.00	39,940	382.00	0.55	0.55	---	---	0.00	0.00	---	---	---	0.55
6.20	42,297	382.20	0.59	0.58	---	---	0.00	0.00	---	---	---	0.58
6.40	44,654	382.40	0.63	0.61	---	---	0.00	0.00	---	---	---	0.61

Continues on next page...

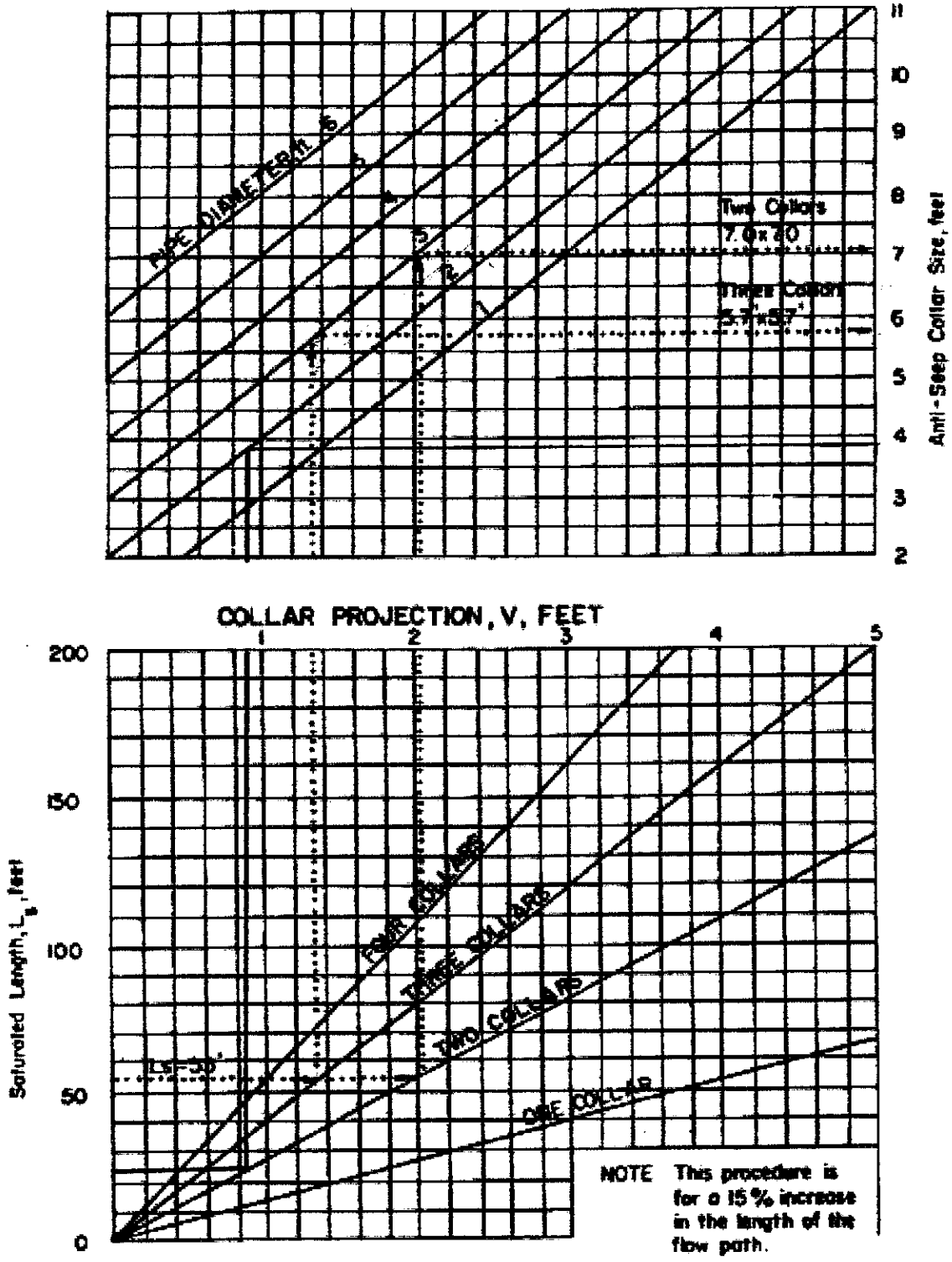
Detention Pond

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
6.60	47,011	382.60	1.90	0.59	---	---	1.26	3.16	---	---	---	5.01
6.80	49,368	382.80	6.98	0.41	---	---	6.57	16.41	---	---	---	23.39
7.00	51,725	383.00	14.44	0.31	---	---	14.13	35.33	---	---	---	49.77
7.20	54,082	383.20	18.94	0.23	---	---	18.71	58.52	---	---	---	77.46
7.40	56,439	383.40	21.52	0.18	---	---	21.34	85.31	---	---	---	106.83
7.60	58,796	383.60	23.47	0.15	---	---	23.32	115.27	---	---	---	138.74
7.80	61,153	383.80	24.89	0.13	---	---	24.76	148.09	---	---	---	172.98
8.00	63,510	384.00	25.90	0.11	---	---	25.79	183.53	---	---	---	209.43

...End

Figure 7A.31(2)
Anti-Seep Collar Design Charts



MJS ENGINEERING

MJS Engineering, PC
261 Greenwich Avenue
Goshen, NY 10924

Detention Pond Calculations

Appendix G

Shadowfax Run Development
Detention Pond A
Water Quality Volume

Water Quality (WQv)

WQv = [(P)(Rv)(A)]/12
Rv = 0.05+0.009(I)
I = Impervious Cover (Percent)

Impervious Area (AC) =	3.30	AC
Total Area (AC) =	9.10	AC
I =	36	%
Rv =	0.38	
Min Rv =	0.20	
Use Rv =	0.38	
P = 90% Rainfall Event Number	1.2	inch
A = Site Area in Acres	9.10	AC
WQv =	14,919	CF
	0.34	AC-FT

Pond Report

Pond No. 1 - Detention Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	376.00	3,040	0	0
2.00	378.00	5,260	8,300	8,300
4.00	380.00	7,970	13,230	21,530
6.00	382.00	10,440	18,410	39,940
8.00	384.00	13,130	23,570	63,510

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 24.00	4.00	0.00	0.00
Span (in)	= 24.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 380.00	380.00	0.00	0.00
Length (ft)	= 30.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	30.00	0.00	0.00
Crest El. (ft)	= 382.50	382.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Ciplti	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control. Weir riser checked for orifice conditions.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00 AC-FT	0	376.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.20	830	376.20	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.40	1,660	376.40	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.60	2,490	376.60	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.80	3,320	376.80	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.00	4,150	377.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.20	4,980	377.20	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.40	5,810	377.40	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.60	6,640	377.60	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.80	7,470	377.80	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	8,300	378.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.20	9,623	378.20	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
CLEANOUT 2.40 0.25	10,946	378.40	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.60	12,269	378.60	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.80	13,592	378.80	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.00	14,915	379.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.20	16,238	379.20	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.40	17,561	379.40	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.60	18,884	379.60	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.80	20,207	379.80	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
WQV 4.00 0.49	21,530	380.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.20	23,371	380.20	0.08	0.08	---	---	0.00	0.00	---	---	---	0.08
4.40	25,212	380.40	0.20	0.20	---	---	0.00	0.00	---	---	---	0.20
4.60	27,053	380.60	0.27	0.27	---	---	0.00	0.00	---	---	---	0.27
4.80	28,894	380.80	0.32	0.32	---	---	0.00	0.00	---	---	---	0.32
5.00	30,735	381.00	0.38	0.37	---	---	0.00	0.00	---	---	---	0.37
5.20	32,576	381.20	0.41	0.41	---	---	0.00	0.00	---	---	---	0.41
5.40	34,417	381.40	0.45	0.45	---	---	0.00	0.00	---	---	---	0.45
5.60	36,258	381.60	0.48	0.48	---	---	0.00	0.00	---	---	---	0.48
5.80	38,099	381.80	0.52	0.52	---	---	0.00	0.00	---	---	---	0.52
6.00	39,940	382.00	0.55	0.55	---	---	0.00	0.00	---	---	---	0.55
6.20	42,297	382.20	0.59	0.58	---	---	0.00	0.00	---	---	---	0.58
6.40	44,654	382.40	0.63	0.61	---	---	0.00	0.00	---	---	---	0.61

Continues on next page...

FORE BAY
376 380 SF
378 1060 SF
380 2010 SF

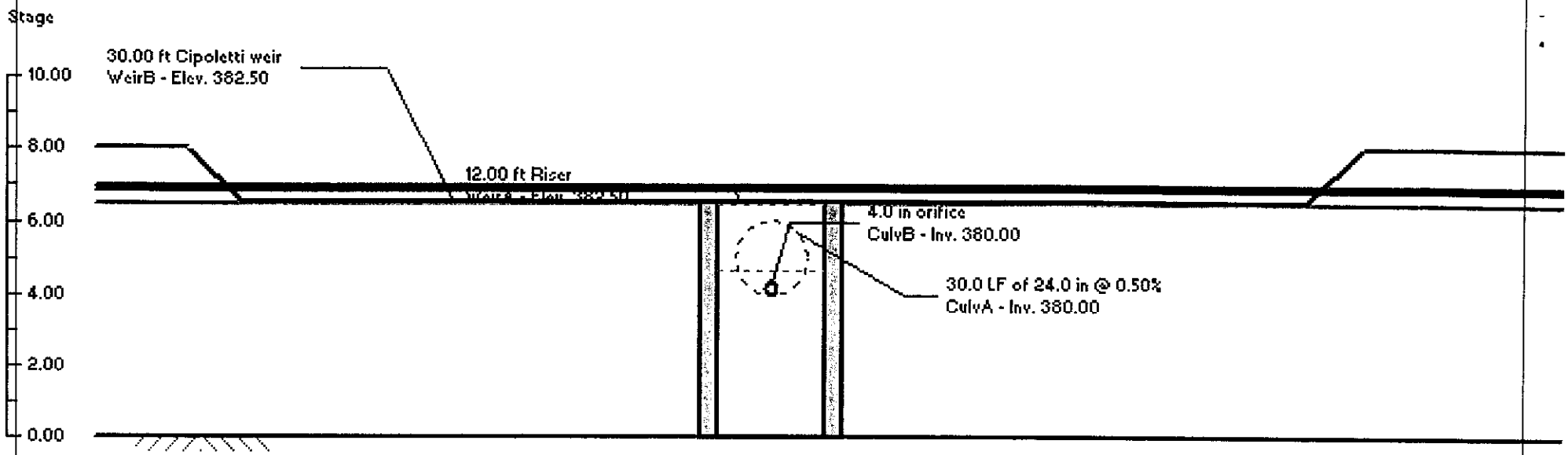
Detention Pond

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
6.60	47,011	382.60	1.90	0.59	---	---	1.26	3.16	---	---	---	5.01
6.80	49,368	382.80	6.98	0.41	---	---	6.57	16.41	---	---	---	23.39
7.00	51,725	383.00	14.44	0.31	---	---	14.13	35.33	---	---	---	49.77
7.20	54,082	383.20	18.94	0.23	---	---	18.71	58.52	---	---	---	77.46
7.40	56,439	383.40	21.52	0.18	---	---	21.34	85.31	---	---	---	106.83
7.60	58,796	383.60	23.47	0.15	---	---	23.32	115.27	---	---	---	138.74
7.80	61,153	383.80	24.89	0.13	---	---	24.76	148.09	---	---	---	172.98
8.00	63,510	384.00	25.90	0.11	---	---	25.79	183.53	---	---	---	209.43

...End

Pond



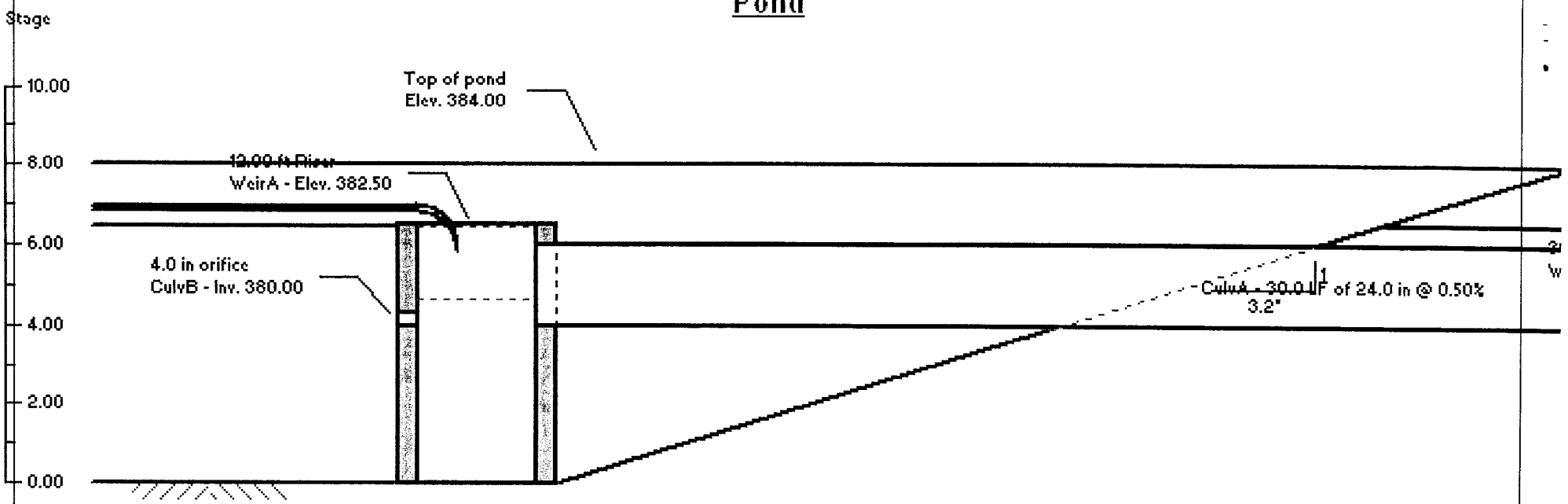
Front View

NTS - Looking Downstream

(100 yr)
(10 yr)
(1 yr)

Schematic only. Not for construction.

Pond



Section

NTS

* Side slope estimated average from contours

Schematic only. Not for construction.

MJS ENGINEERING

MJS Engineering, PC
261 Greenwich Avenue
Goshen, NY 10924

SWPPP Certification Forms

Appendix H

Contractors SWPPP Certification Form

Shadowfax Run Development, LP
South Jackson Avenue
Section 54, Block 1, Lot 44.2
Town of New Windsor, Orange County, NY

I certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP for the construction site identified in such SWPPP as a condition of authorization to discharge stormwater. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards.

_____ _____
Name Date

_____
Title

_____
Firm

_____
Address

_____
Telephone

Owner's SWPPP Certification Form

Shadowfax Run Development, LP
South Jackson Avenue
Section 54, Block 1, Lot 44.2
Town of New Windsor, Orange County, NY

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law.

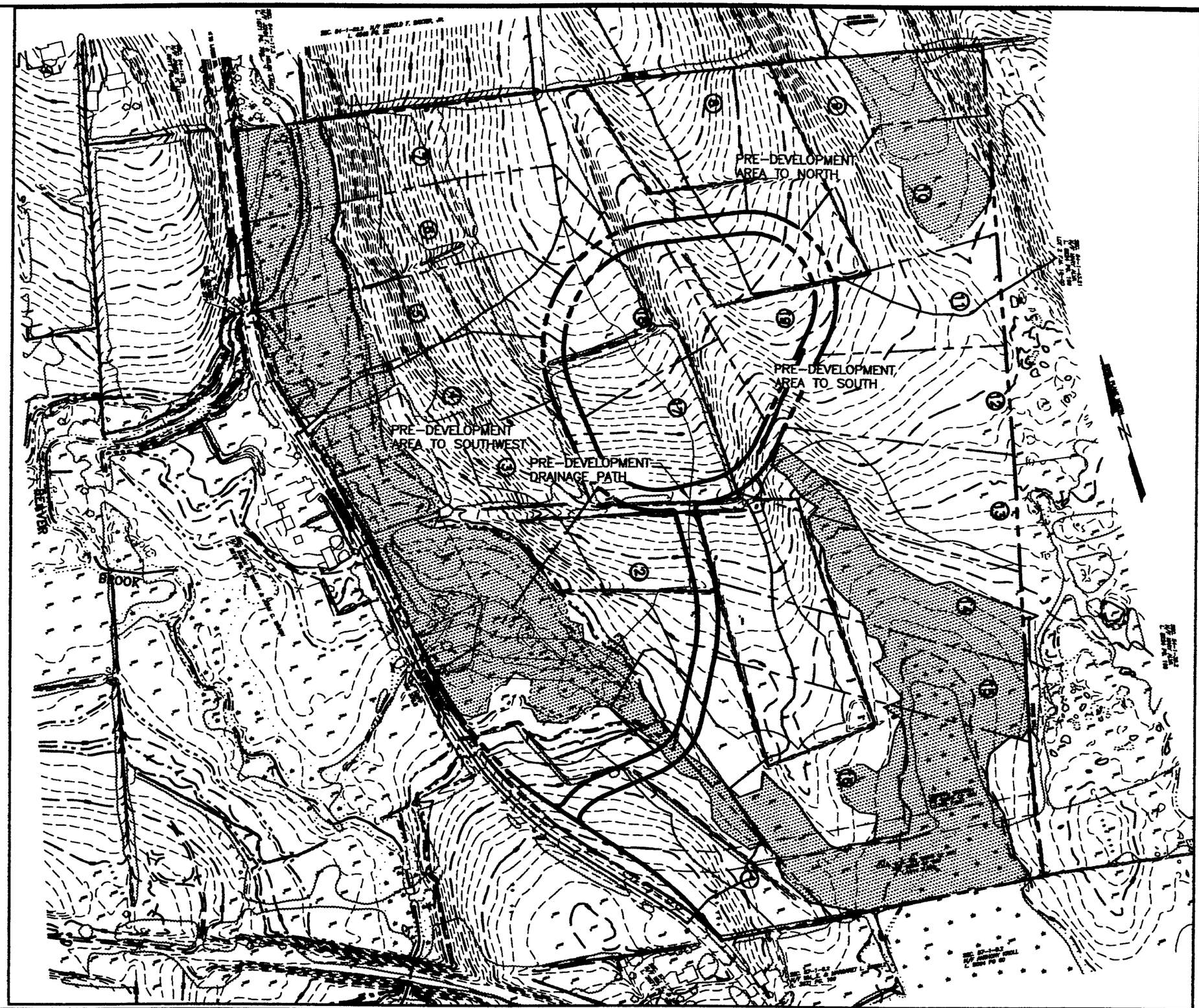
_____ _____
Name Date

_____
Title

_____
Firm

_____
Address

_____
Telephone



MJS ENGINEERING & LAND SURVEYING, PC

261 Greenwich Ave
Goshen, NY 10924
845-291-8650
Fax 845-291-8657

SHEET TITLE:

PRE-DEVELOPMENT SITE DRAINAGE AREA

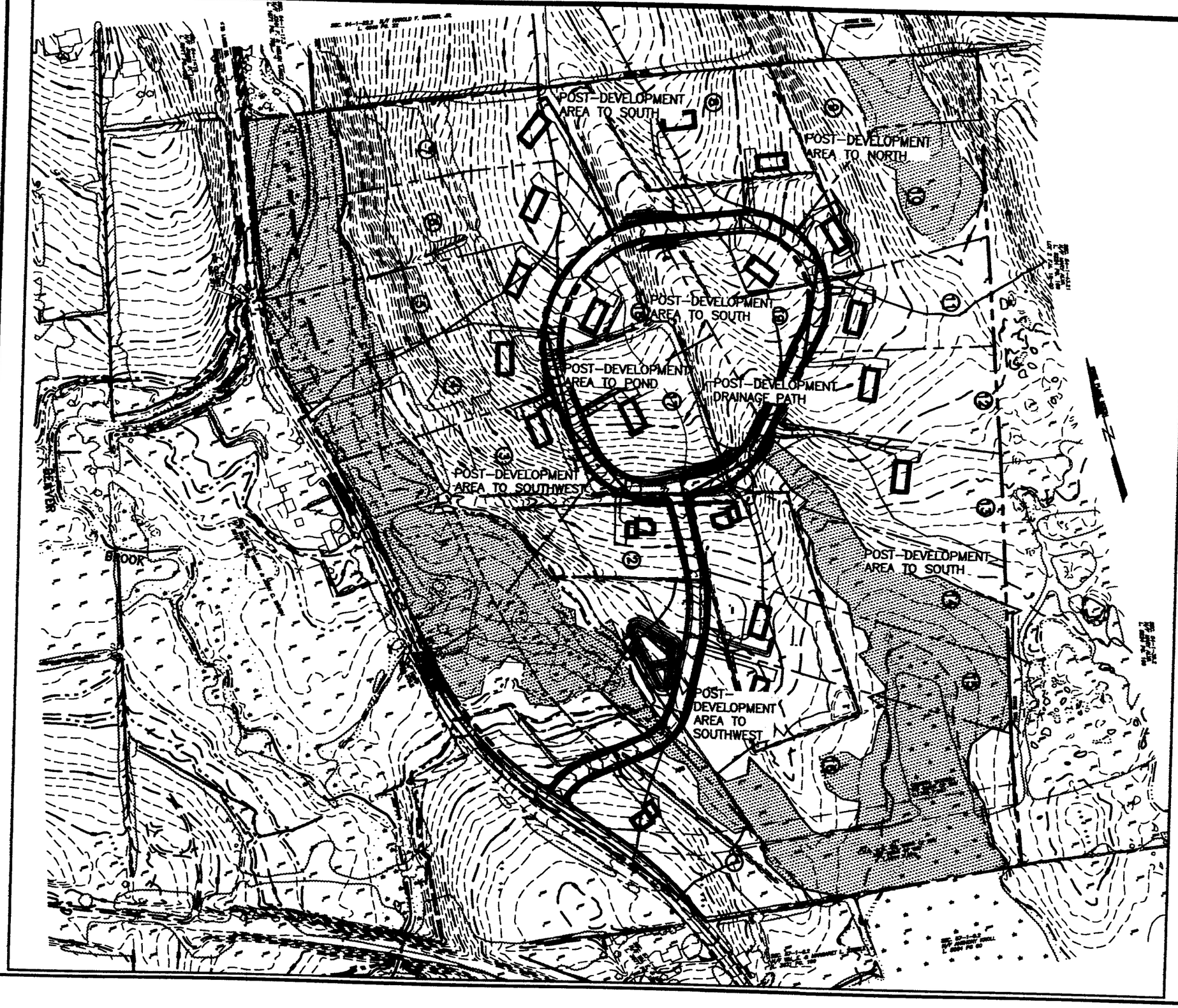
JOB NAME:

SHADOWFAX RUN DEVELOPMENT, LP

TOWN OF NEW WINDSOR
ORANGE COUNTY, NEW YORK

DRAWN BY: B. CHRISTIE	
DEPT. CK. M. SANDOR	
DEP. APPR.	
JOB NO. 030119	DATE: 4/12/06
	REV. NO. A
SCALE: 1"= 250'	FIG. NO. 1

P:\030119\030119ba.dwg Pre



MJS ENGINEERING & LAND SURVEYING, PC

261 Greenwich Ave
Goshen, NY 10924
845-291-8650
Fax 845-291-8657

SHEET TITLE:

POST-DEVELOPMENT SITE DRAINAGE AREA

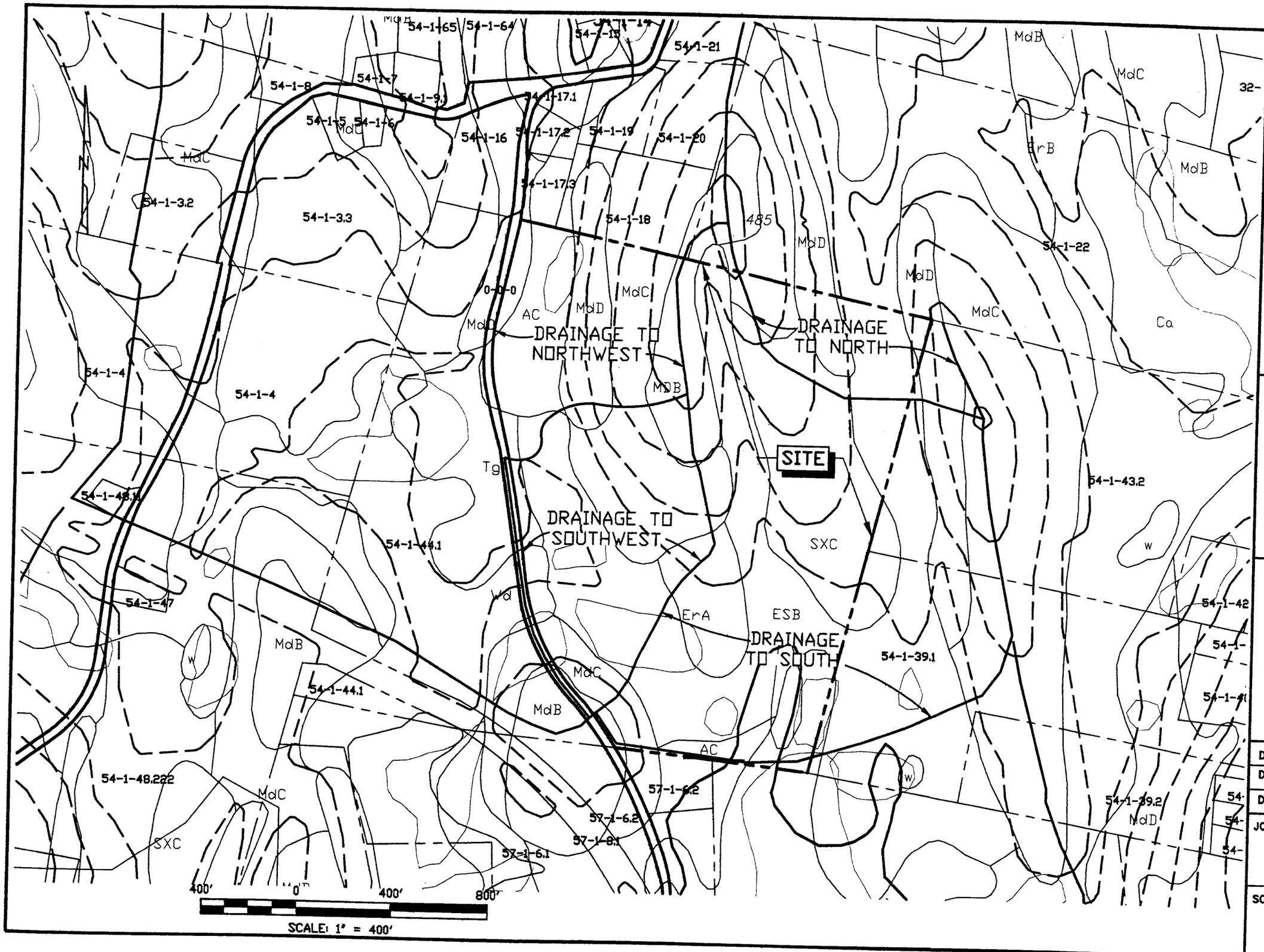
JOB NAME:

SHADOWFAX RUN DEVELOPMENT, LP

TOWN OF NEW WINDSOR
ORANGE COUNTY, NEW YORK

DRAWN BY: B. CHRISTIE	
DEPT. CK. M. SANDOR	
DEP. APPR.	
JOB NO. 030119	DATE: 4/12/06
	REV. NO. A
SCALE: 1"= 250'	FIG. NO. 2

P:\030119\030119ea.dwg Post



MJS ENGINEERING

MJS Engineering and Land Surveying, PC
281 Greenwich Ave
Goshen, NY 10924
845-291-8650
Fax 845-291-8657

SHEET TITLE:

SITE SOILS

JOB NAME:

KARTIGANER–SHADOWFAX

TOWN OF NEW WINDSOR
ORANGE COUNTY, NEW YORK

DRAWN BY: P HUTTON	
DEPT. CK. M. SANDOR	
DEP. APPR.	
JOB NO. 030119	DATE: 2/12/04
	REV. NO. B
SCALE: 1"=400'	DWG. NO. 3

D is a photo of the outflow of the culvert to the EAST side on the side of the proposed Shadowfax Run development. The culvert is submerged below the 7 Up bottle in the picture. At time of this photo, the culvert was submerged on both sides approximately 4 to 6 inches below the water level. The water was approximately 2' below the top of Jackson Ave.

Page 4 4 pictures,

A is photo of the backwater on the west side looking east toward Jackson Avenue and the Shadowfax site. All this water is part of backwater flooding behind the rail road back up along the south side of Waugh's property to east. The speed sign is visible in the picture and used as referenced given that this backwater location is where the culvert across Jackson Avenue is located.

B is photo of backwater to EAST side of Jackson Ave. Reference the green bottle on the upper left. The photo shows the asphalt cut in Jackson Avenue that was made for the culvert installation located below road at this location.

C is a photo of the "outflow" of the culvert to the East. Reference is made to the green bottle and it is noted the dead deer submerged in the area of the culver in this location. Again, it is noted there is no current or outflow visible at this drainage culvert location.

D is a photo of the outflow of the culvert to the EAST side. Again the green bottle is noted as reference. The top of the submerged culvert can be seen in the middle on the bottom just above the snow. The top of this culvert was at least 4 to 6 " below the top of water and there is clearly no current or water flow moving out of the culvert one way or the other.

Page 5 4 pictures,

A, B, C & D are photo documentation of back water conditions to west of Jackson Avenue in field directly below the drain area of the culvert and in the area above the choke point in the stream across the Rail Road ROW. Backwater conditions show water build up in the field to the south of the Waugh's homestead and along and through trees to area abutting Jackson Avenue.

Page 6 4 pictures,

A, B, C & D are photo documentation of back water conditions to west of Jackson Avenue in field directly below the culvert and an area above the choke point in the stream. Backwater conditions show water build up in the field to the south of the Waugh's homestead and along and through trees to area abutting Jackson Avenue.

Note on photo D middle left, the white truck can be seen through trees as location reference of photo. The truck was parked approximately 25 to 30 feet above the culvert at time of this photo.

Page 7 pictures,

A, B, are photo documentation of back water conditions to west of Jackson Avenue along area of culvert. Photo A shows asphalt work and recess at location of culvert below.

C & D show extent of backwater condition using reference of "x" marked in roadway and truck location as noted north of culvert. Both pictures show backwater along the low point of Jackson Avenue on either side of culvert. There is no evidence of current anywhere because water is backed up behind the choke point at the rail road right of way.

Page 8 pictures,

A is a photo of extent of flooding and backwater condition at "x" in middle of Jackson Avenue.

B, is a photo of backwater condition looking south west of culvert. Reference point is 40 mile hour speed limit sign.

C is a photo of extent of flooding and backwater condition at culvert from north west of flooding conditions. Truck reference is noted to left of photo.

D is a photo of extent of flooding and backwater condition below culvert facing to north east. Line of Jackson Avenue roadway is visible through tree line.

What is demonstrated in these photos is that under significant, but not extreme, weather conditions the extent of flooding along Jackson Avenue follows the model and flood study as performed by MJS Engineering for the Shadowfax Run Subdivision. In simple terms, the flood condition of January 14, 2005 were not at a level or to the degree as would be found in the case of a 100, 50 or 10 storm/ flood cycle. With minimal snow on the ground that was subject to melting and some heavy rains over a few days, the area behind the rail road right of way was flooded to within less than 2' of the top of Jackson Avenue.

The photos confirm the existence of these flood conditions and demonstrate in visual form that the 36" culvert below Jackson Avenue in the area of this flooding is not capable of correcting the flood conditions in the area given that it was submerged under "backwater conditions" on both sides of the road at the time of these photographs/ .

If there are any questions or issues with this memo and attachments, please contact the writer as appropriate.

Respectfully submitted:

Drew Kartiganer

Saved on:	DAK computer, my docs
Saved in:	Development file; Shadowfax run
Saved as:	Memo ot file. 1 17 05. on flood conditions of Friday, January 14, 2005. Update and send, 2 15 05